REMARKS

I. DRAWING AMENDMENTS

The Drawings have been amended at Figs. 2A, 2C, 2F, 6B, 6D, 7D, 8A, 8B, 9A, 9B, 10A, 10B, 10C, 11A, 11B, 12A, 12B, 13B, 14B, 14C and 14D to improve clarity. No new matter has been added.

The Appendix with amended drawing figures is attached hereto. The Appendix includes a Replacement Sheet and an Annotated Sheet Showing Changes for each amended figure.

Fig. 2A

Metal base 120 is shown in Figs. 2A and 2B. Metal base 120 includes surfaces 122 and 124, central portion 126, slots 128, recessed portions 130, 132 and 134, non-recessed portions 136 and leads 138. Recessed portions 130 are formed in surface 122 and spaced from slots 128, recessed portions 132 are formed in surface 124 between slots 128, non-recessed portions 136 are formed between slots 128, and leads 138 include recessed portions 132 and non-recessed portions 136.

In Fig. 2A as amended, reference character 132 has a straighter lead line.

Figs. 2C and 2F

Photoresist layers 142 and 144 are formed on surfaces 122 and 124, respectively, in Figs. 2C and 2F. Metal traces 144 are formed on metal base 120 in Figs. 3A and 3B. Thus, reference character 144 is used twice.

In Figs. 2C and 2F as amended, photoresist layer 143 (rather than 144) is formed on surface 124.

Fig. 6B

Encapsulant 156 is formed on chip 110 and metal base 120 and fills slots 128 and recessed portions 132 and 134 in Figs. 6A and 6B. Encapsulant 156 includes top surface 160, peripheral side surfaces 162, bottom surface 164 and peripheral portion 166

In Fig. 6B as amended, reference character 156 points to encapsulant 156 rather than lead 138, as would be apparent to those skilled in the art.

Figs. 6D and 7D

Leads 138 extend outwardly from central portion 126 between slots 128 and include recessed portions 132 and non-recessed portions 136 in Figs. 2A and 2B.

Metal traces 144 are formed on metal base 120 in Figs. 3A and 3B. Metal traces 144 include terminals 146 in recessed portions 130 and routing lines 148 outside recessed portions 130 that extend to recessed portions 132. Conductive traces 150 include leads 138 and metal traces 144.

Adhesive 154 is formed on metal base 120 and metal traces 144 in Figs. 4A and 4B.

Chip 110 is mechanically attached to metal base 120 using adhesive 154 in Figs. 5A and 5B. Leads 138 are outside the periphery of chip 110 as shown in Fig. 5A.

Encapsulant 156 is formed on chip 110 and metal base 120 and fills slots 128 and recessed portions 132 and 134 in Figs. 6A and 6B.

Encapsulant 156 is removed from laterally extending portions of slots 128 in Figs. 7A and 7B.

Figs. 2F, 2G and 2H are enlarged cross-sectional views showing the formation of recessed portions 130 and 132 taken across line 2F—2F in Figs. 2A and 2B, Figs. 3C, 3D and 3E are enlarged cross-sectional views showing the formation of metal trace 144 taken across line 3C—3C in Fig. 3A, Fig. 4C is an enlarged cross-sectional view showing adhesive 154 taken

across line 4C—4C in Fig. 4A, Fig. 6D is an enlarged cross-sectional view showing encapsulant 156 taken across line 6D—6D in Fig. 6A, and Fig. 7D is an enlarged cross-sectional view showing encapsulant 156 taken across line 7D—7D in Fig. 7A.

Although lead 138 is not labeled in Figs. 6D and 7D, its identification is clear from Figs. 2A, 2B, 2G, 3D, 4C, 5A and 6B. Although metal trace 144 is not labeled in Figs. 6D and 7D, its identification is clear from Fig. 3D. Although terminal 146 is not labeled in Figs. 6D and 7D, its identification is clear from Figs. 3D and 4C.

In Figs. 6D and 7D as amended, lead 138, metal trace 144 and terminal 146 are labeled, as would be apparent to those skilled in the art.

Figs. 8A, 8B, 9A, 9B, 10A, 10B, 11A, 11B, 12A and 12B

Protective coating 170 is formed on metal base 120 outside encapsulant 156 in Figs. 8A and 8B. Protective coating covers the exposed surfaces of metal base 120 outside central portion 126 of metal base 120, and central portion 126 remains exposed. Protective coating 170 is considered a surface layer that is part of metal base 120 and leads 138.

In Figs. 8A, 8B, 9A, 9B, 10A, 10B, 11A, 11B, 12A and 12B as amended, the lines between leads 138 and the rectangular peripheral frame of metal base 120 are removed so that Figs. 8A, 8B, 9A, 9B, 10A, 10B, 11A, 11B, 12A and 12B are consistent with Figs. 7A and 7B, as would be apparent to those skilled in the art.

In Figs. 8B, 9B, 10B, 11B and 12B as amended, the lines between the portion of metal base 120 that protrudes from the opposing narrow side surfaces 162 of encapsulant 156 and the rectangular peripheral frame of metal base 120 are removed so that Figs. 8B, 9B, 10B, 11B and 12B are consistent with Fig. 7B, as would be apparent to those skilled in the art.

In Fig. 8B as amended, the lines in metal base 120 that protrude from the opposing narrow side surfaces 162 of encapsulant 156 are removed so that Fig. 8B is consistent with Fig. 7B, as would be apparent to those skilled in the art.

Figs. 9B, 10B, 11B and 12B

Central portion 126 of metal base 120 is removed thereby exposing terminals 146, routing lines 148 and adhesive 154 in Figs. 9A and 9B. Central portion 126 is removed by a wet chemical etch that has no appreciable effect on protective coating 170. Thus, metal base 120 outside encapsulant 156 remains intact. In particular, the four portions of metal base 120 adjacent to the opposing narrow side surfaces 162 of encapsulant 156 and parallel to leads 138 remain intact as shown in Fig. 9A.

Openings 176 are formed in adhesive 154 that expose pads 116 in Figs. 10A and 10B.

Connection joints 180 are formed in openings 176 that contact and electrically connect pads 116 and routing lines 148 in Figs. 11A and 11B.

Insulative base 182 is formed within peripheral portion 166 of encapsulant 156 in Figs. 12A and 12B. Terminals 146 protrude from insulative base 182 and are exposed. Encapsulant 156 and insulative base 182 in combination form insulative housing 184.

In Figs. 9B, 10B, 11B and 12B as amended, the four portions of metal base 120 adjacent to the opposing narrow side surfaces 162 of encapsulant 156 and parallel to leads 138 are shown and the various lines they cover or eliminate are removed so that Figs. 9B, 10B, 11B and 12B are consistent with Fig. 8B and with Figs. 9A, 10A, 11A and 12A, respectively, as would be apparent to those skilled in the art.

Fig. 10C

Chip 110 is mechanically attached to metal base 120 using adhesive 154 such that routing lines 148 overlap and are electrically isolated from pads 116, and adhesive 154 contacts and is sandwiched between routing lines 148 and pads 116 in Figs. 5A and 5B. Routing line 148 includes a distal end that overlaps pad 116 as shown in Fig. 5C.

Openings 176 are formed in adhesive 154 that expose pads 116 in Figs. 10A and 10B. Openings 176 are formed using projection laser ablation. The laser removes portions of adhesive

154 above pads 116 outside routing lines 148. However, routing lines 148 shield the underlying adhesive 154 from the laser etch so that the portions of adhesive 154 sandwiched between routing lines 148 and pads 116 remain intact.

Fig. 10C is an enlarged perspective view of encircled detail 10C in Fig. 10B that shows pad 116, routing line 148 and opening 176 in greater detail, and Figs. 10D and 10E are enlarged cross-sectional views taken across lines 10D—10D and 10E—10E, respectively, in Fig. 10C. Adhesive 154 is shown between routing line 148 and pad 116 in Figs. 10D and 10E.

In Fig. 10C as amended, adhesive 154 is shown between routing line 148 and pad 116, as would be apparent to those skilled in the art.

Figs. 13B, 14B and 14D

Semiconductor package device 186 is singulated from the lead frame in Figs. 13A and 13B. Metal base 120 is selectively cut to remove all portions of metal base 120 except for leads 138 outside insulative housing 184. This can be accomplished using an excise blade that selectively cuts metal base 120 at predetermined regions adjacent to leads 138 and insulative housing 184. Thus, metal base 120 at the opposing narrow side surfaces 162 of encapsulant 156 laterally extends to peripheral portion 166 of encapsulant 156 as shown in Fig. 13A.

Leads 138 are bent in Figs. 14A and 14B, and as an alternative arrangement, leads 138 are bent in the opposite direction in Figs. 14C and 14D.

In Figs. 13B, 14B and 14D as amended, metal base 120 at the narrow side surface 162 of encapsulant 156 laterally extends to peripheral portion 166 of encapsulant 156 so that Figs. 13B, 14B and 14D are consistent with Figs. 13A, 14A and 14C, respectively, as would be apparent to those skilled in the art.

Figs. 14C and 14D

Leads 138 are bent at inner corners 138A and outer corners 138B in Figs. 14A and 14B. As a result, leads 138 include inner lateral portions 138C between inner corners 138A and

insulative housing 184, vertical portions 138D between corners 138A and 138B, and outer lateral portions 138E between outer corners 138B and distal ends 138F as shown in Fig. 14A.

In Fig. 14A, inner lead portions 138C of leads 138 that extend from the top-right side surface 162 of encapsulant 156 are shortened due to overlap by top surface 160 of encapsulant 156, and in Fig. 14B, inner lead portions 138C of leads 138 that extend from the top-right side surface 162 of encapsulant 156 are not shortened.

In Fig. 14C as amended, inner lead portions 138C of leads 138 that extend from the top-right side surface 162 of encapsulant 156 are shortened so that Fig. 14C is consistent with Fig. 14A, as would be apparent to those skilled in the art, and in Fig. 14D as amended, inner lead portions 138C of leads 138 that extend from the top-right side surface 162 of encapsulant 156 are lengthened so that Fig. 14D is consistent with Fig. 14B, as would be apparent to those skilled in the art.

II. FORMAL DRAWINGS

The Formal Drawings attached hereto include the drawing amendments discussed above.

III. CONCLUSION

In view of the amendments and remarks set forth herein, the application is believed to be in condition for issuance. Should any issues remain, the Examiner is encouraged to telephone the undersigned attorney.

I hereby certify that this correspondence is being deposited with the United States Postal Service as Express Mail ER735731194US in an envelope addressed to: Mail Stop Issue Fee, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on September 28, 2004.

D Sigmond — 9/28/04

David M. Sigmond
Attorney for Applicant

Date of Signature

Respectfully submitted,

D Sigmond

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Annotated Sheet Showing Changes

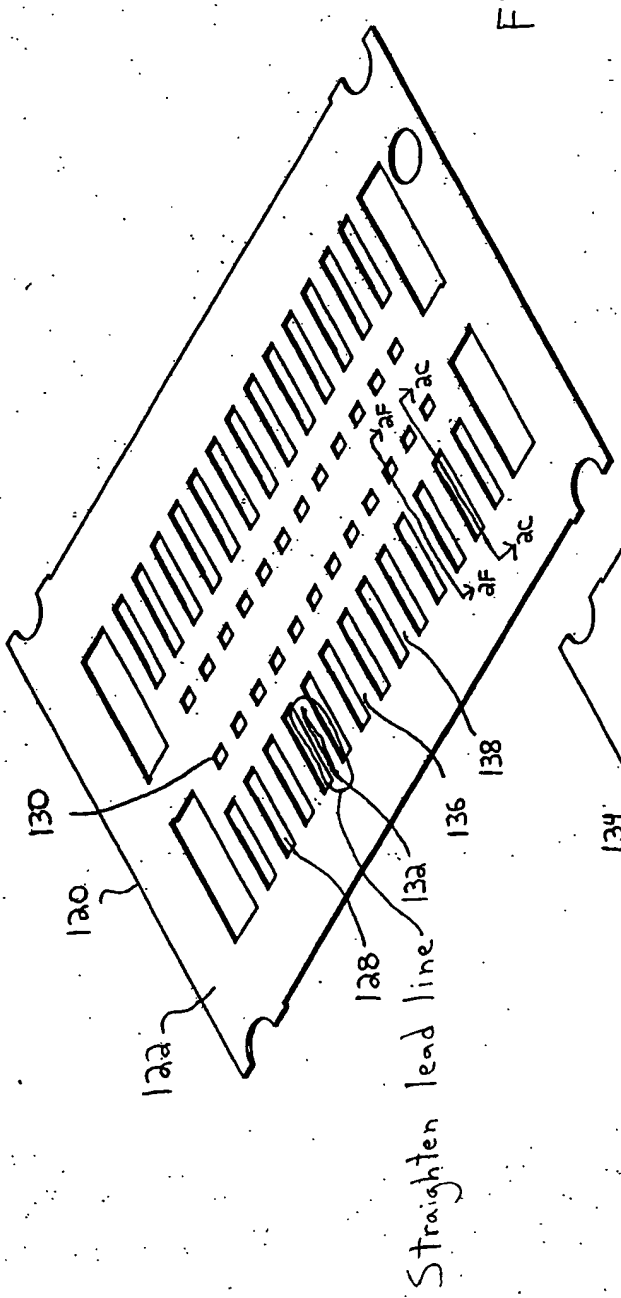


FIG. 2A

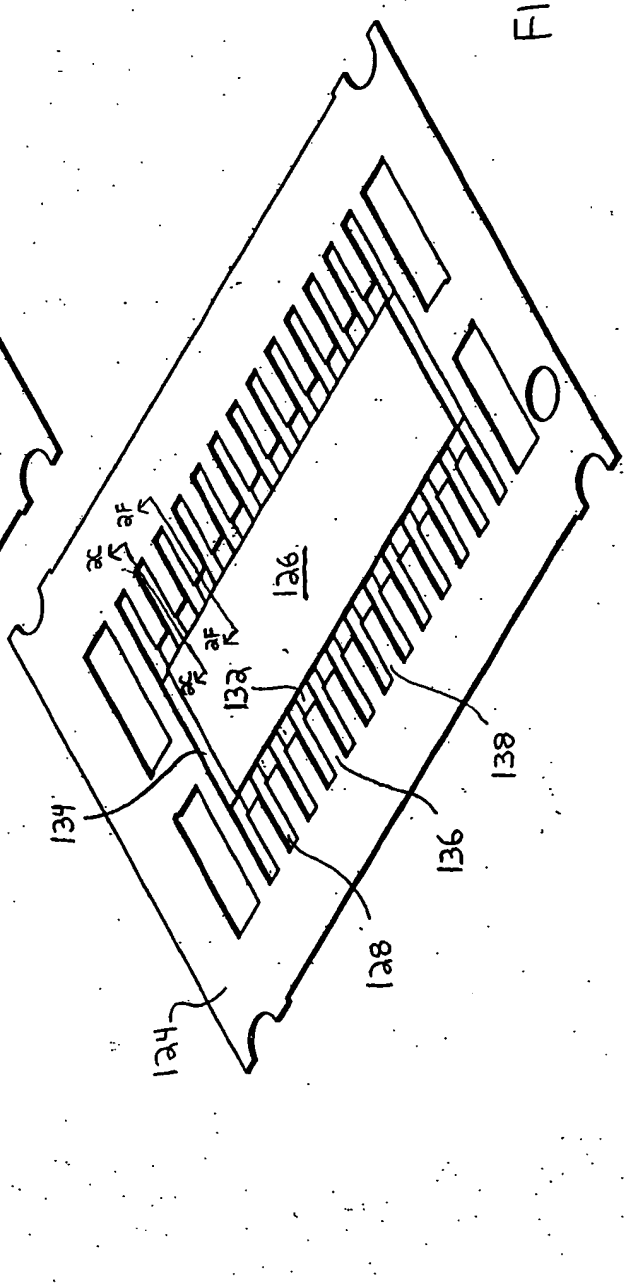


FIG. 2B

Annotated Sheet Showing Changes

FIG. 2C

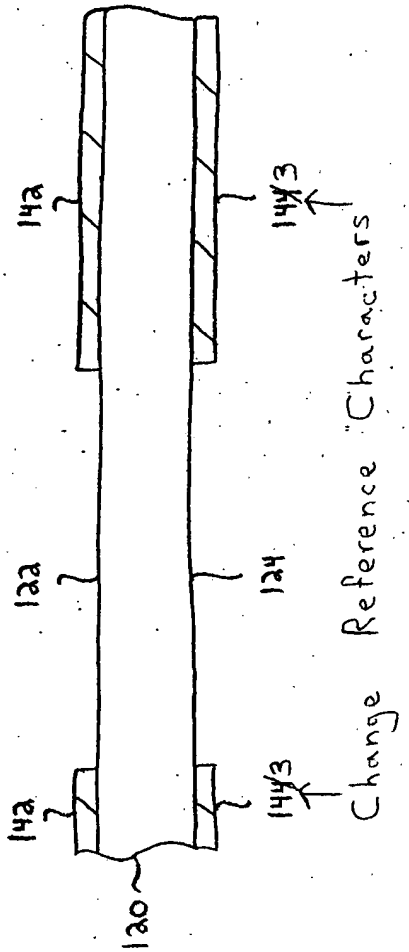


FIG. 2D

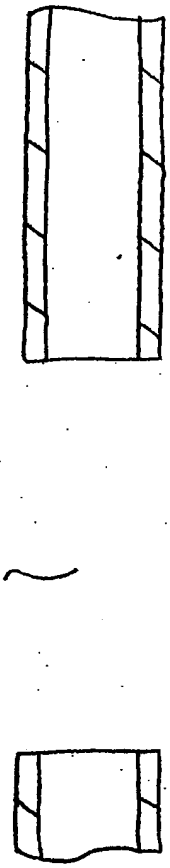
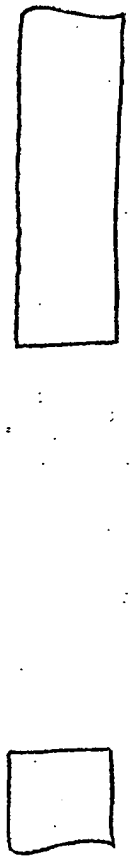


FIG. 2E



Annotated Sheet Showing Changes

FIG. 2F

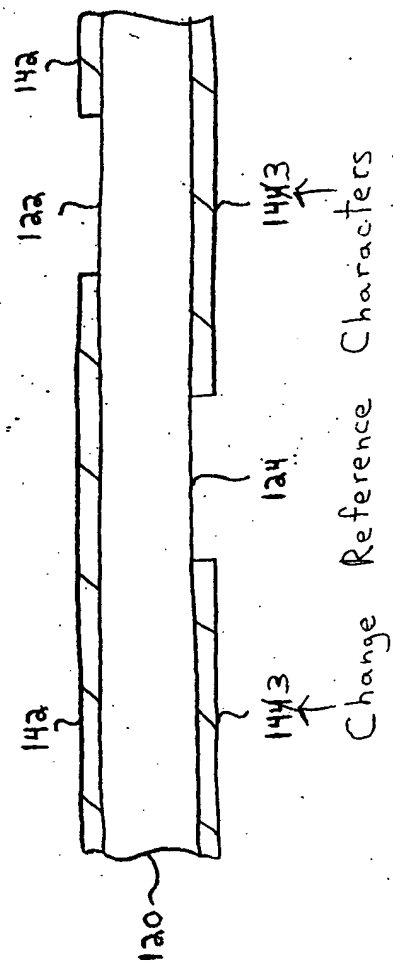


FIG. 2G

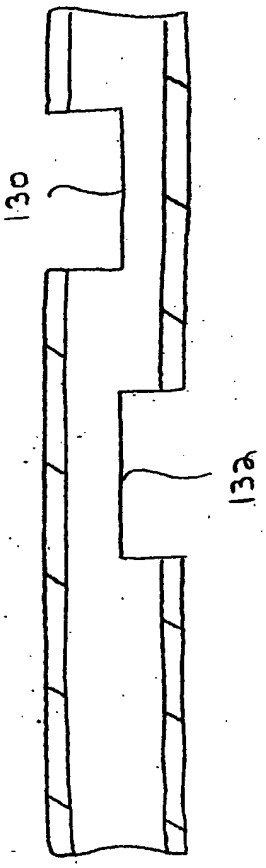


FIG. 2H

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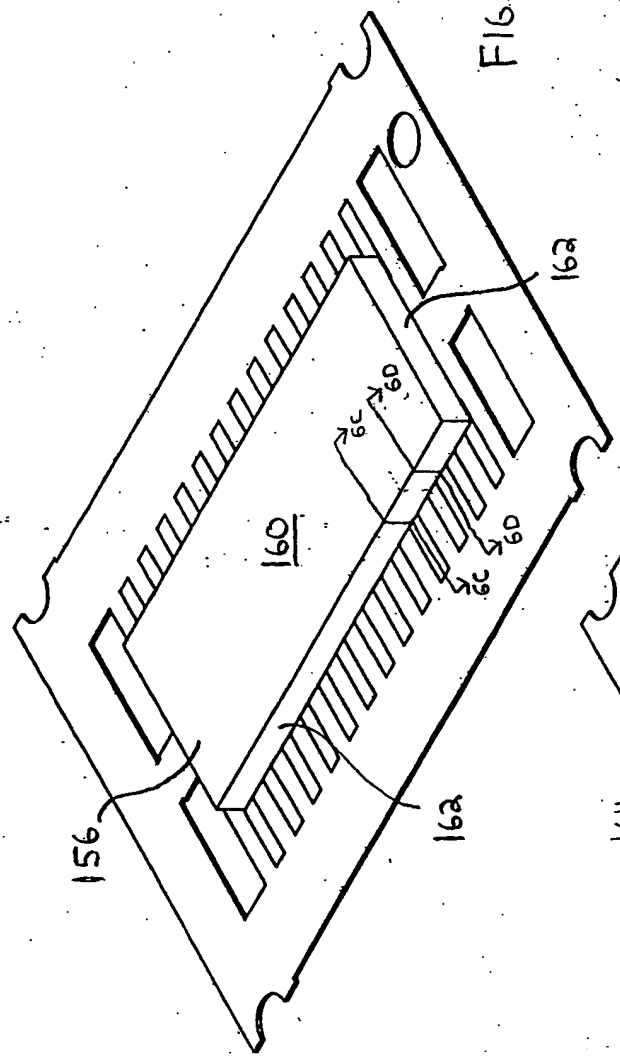


FIG. 6A

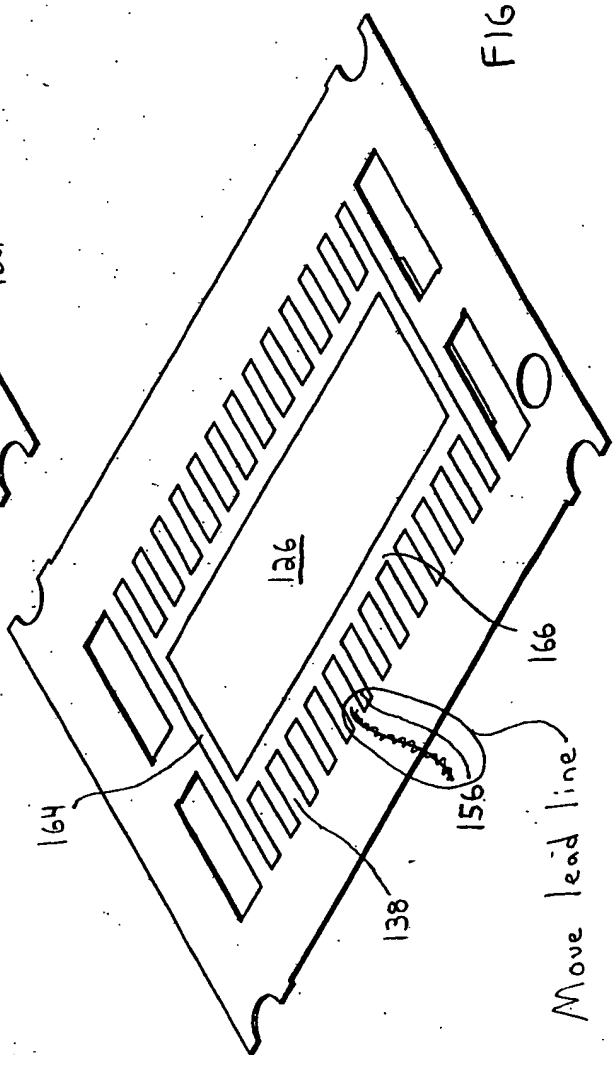


FIG. 6B

Annotated Sheet Showing Changes

FIG. 6C

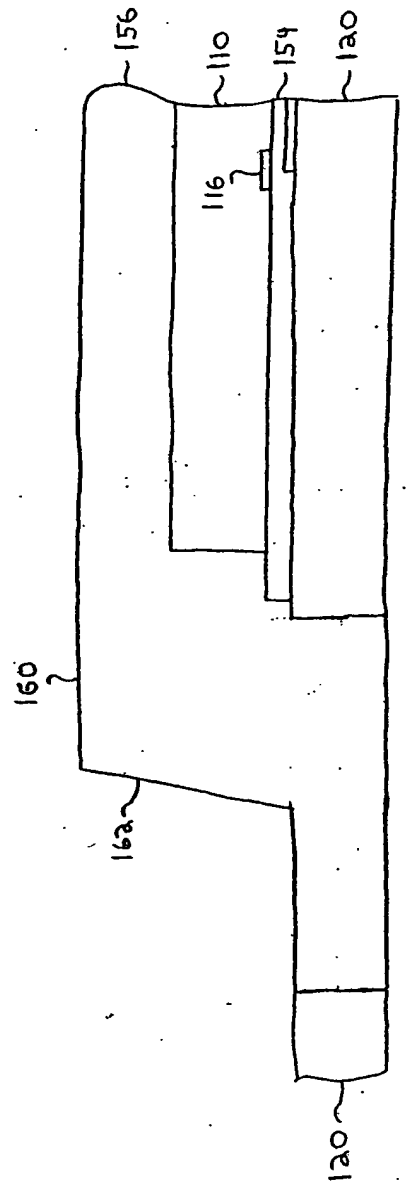
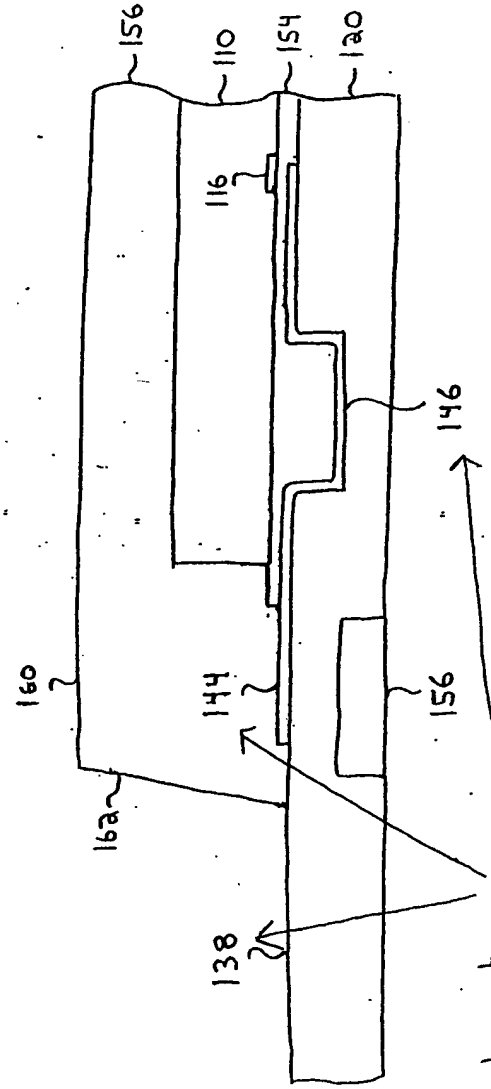


FIG. 6D



Add reference characters

Annotated Sheet Showing Changes

FIG. 7C

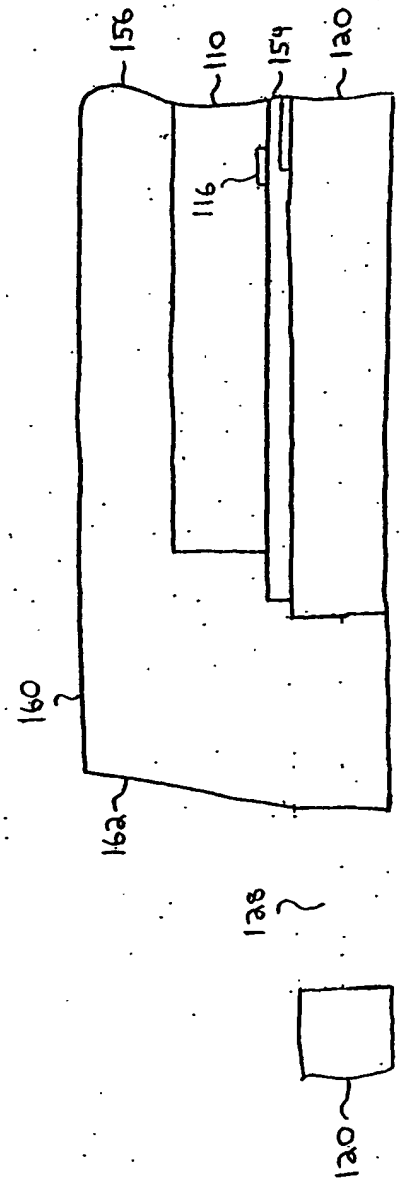
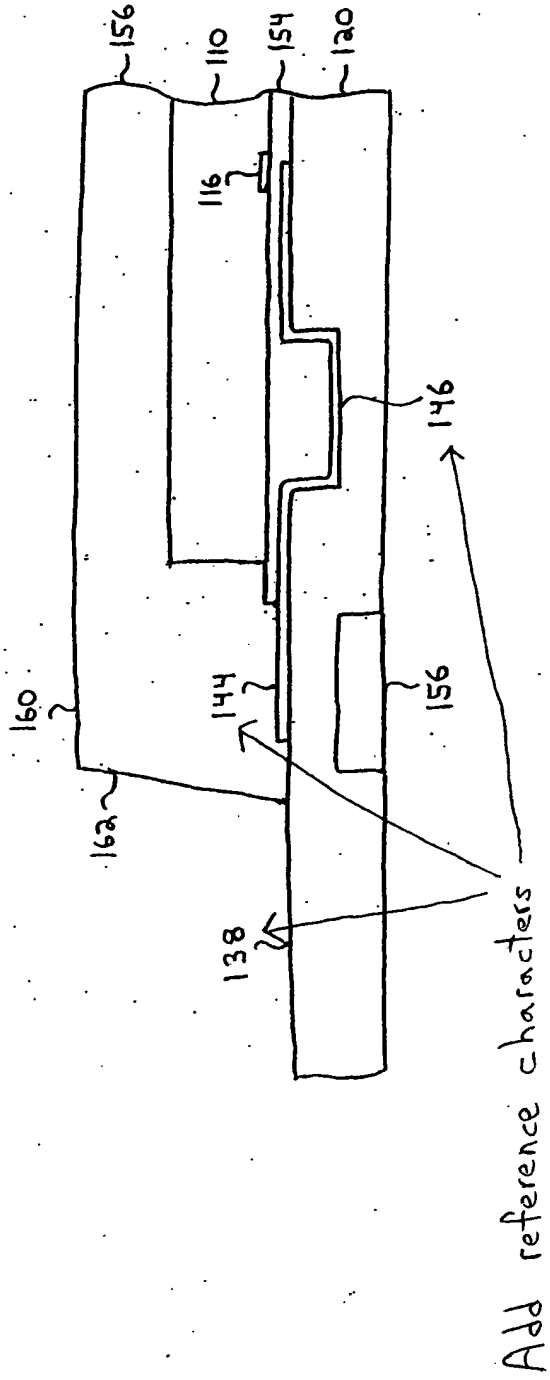


FIG. 7D



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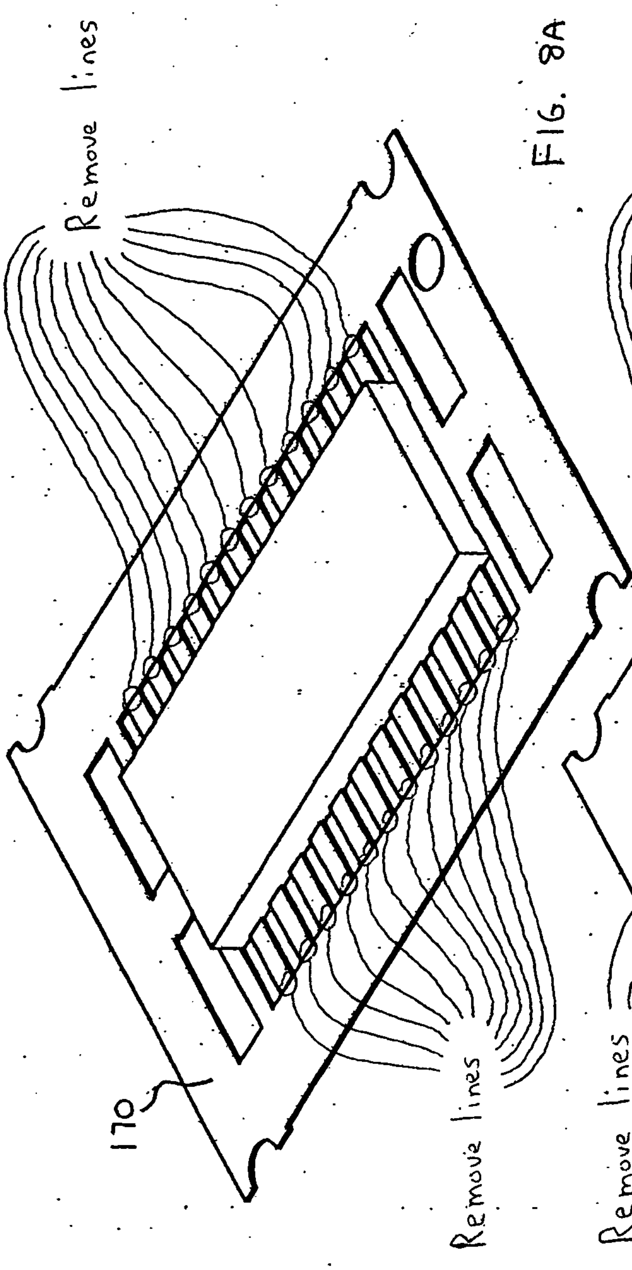


FIG. 8A

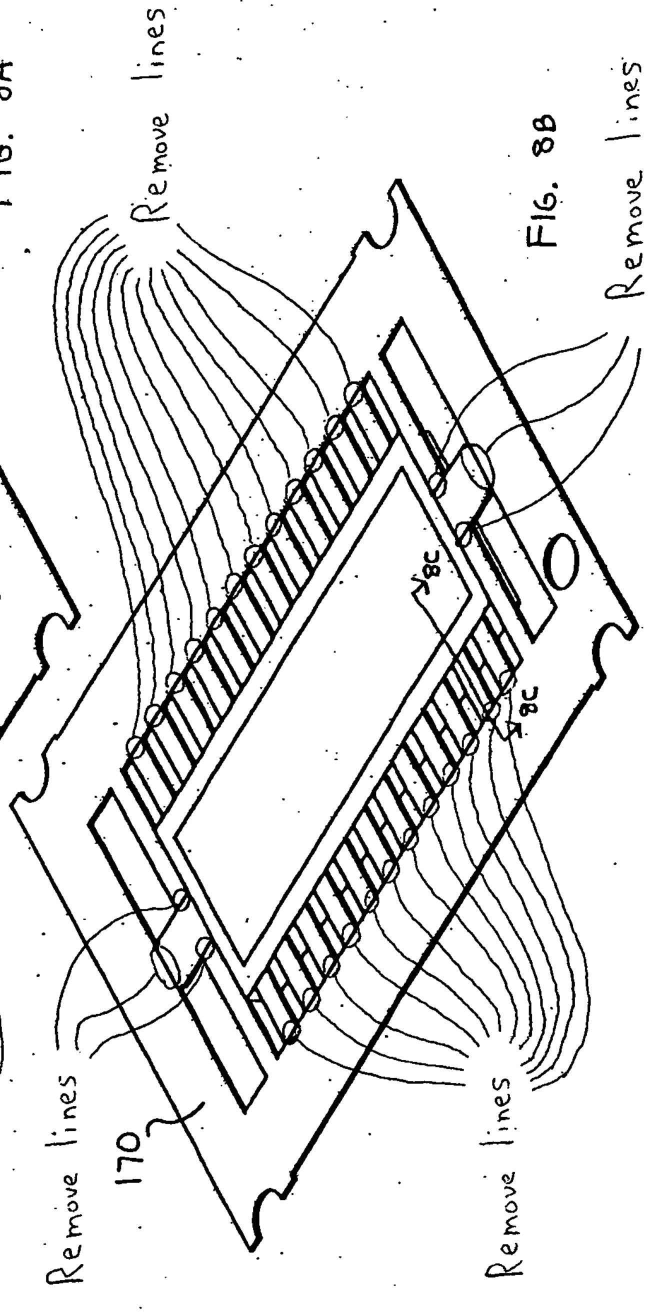


FIG. 8B

Annotated Sheet Showing Changes

Annotated Sheet Showing Changes

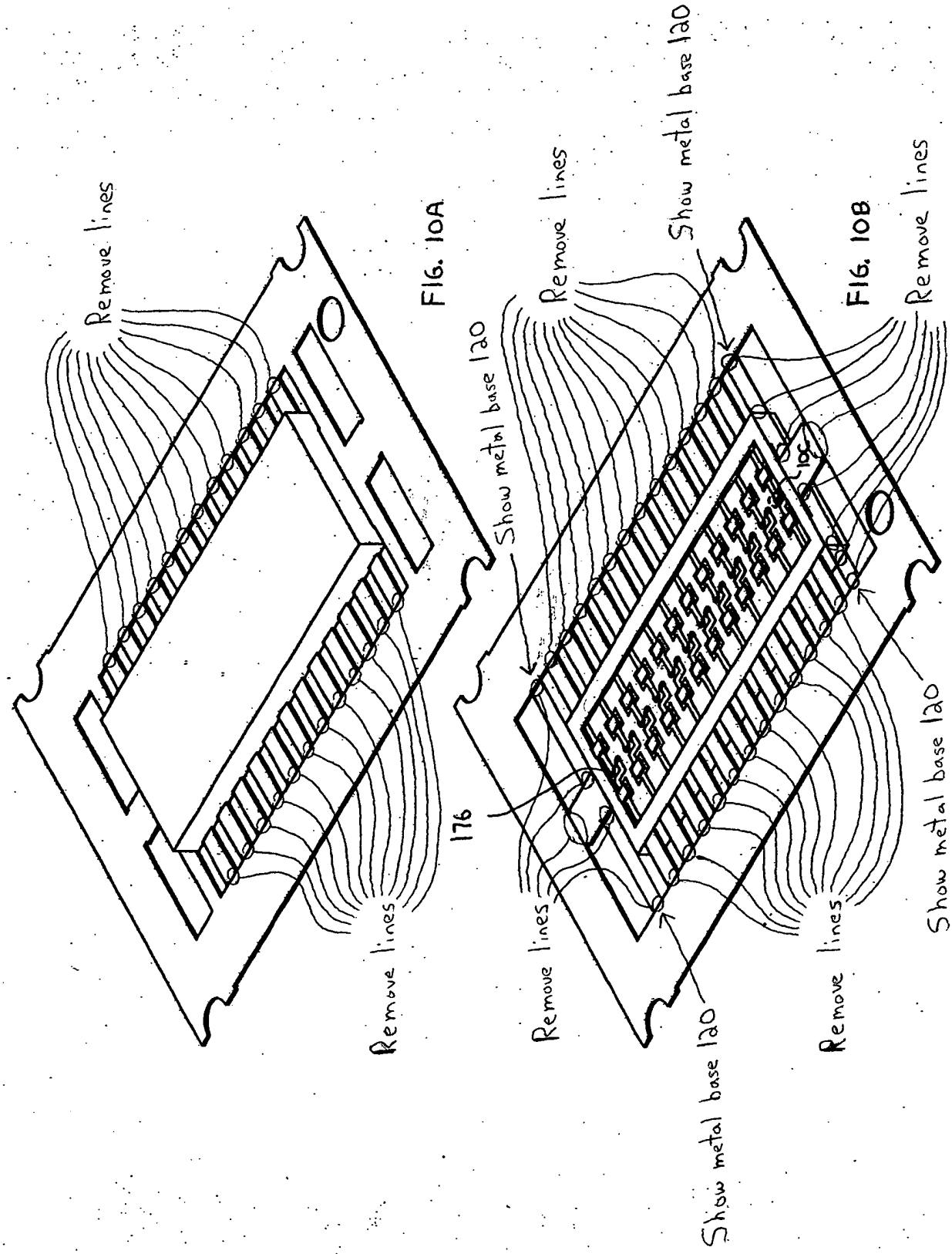
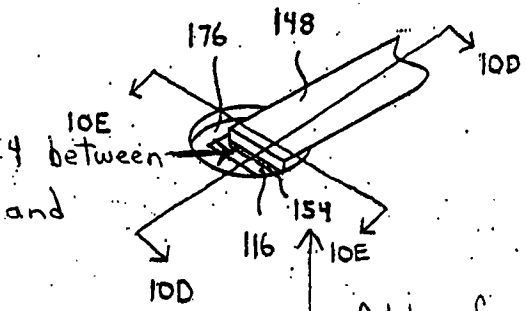


FIG. 10A

FIG. 10B

Annotated Sheet Showing Changes



Show adhesive 154 between routing line 148 and pad 116

FIG. 10C

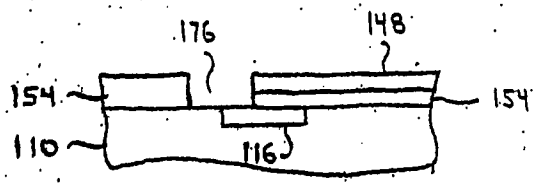


FIG. 10D

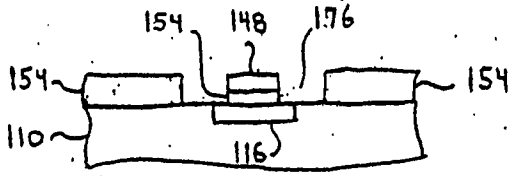


FIG. 10E

Annotated Sheet Showing Changes

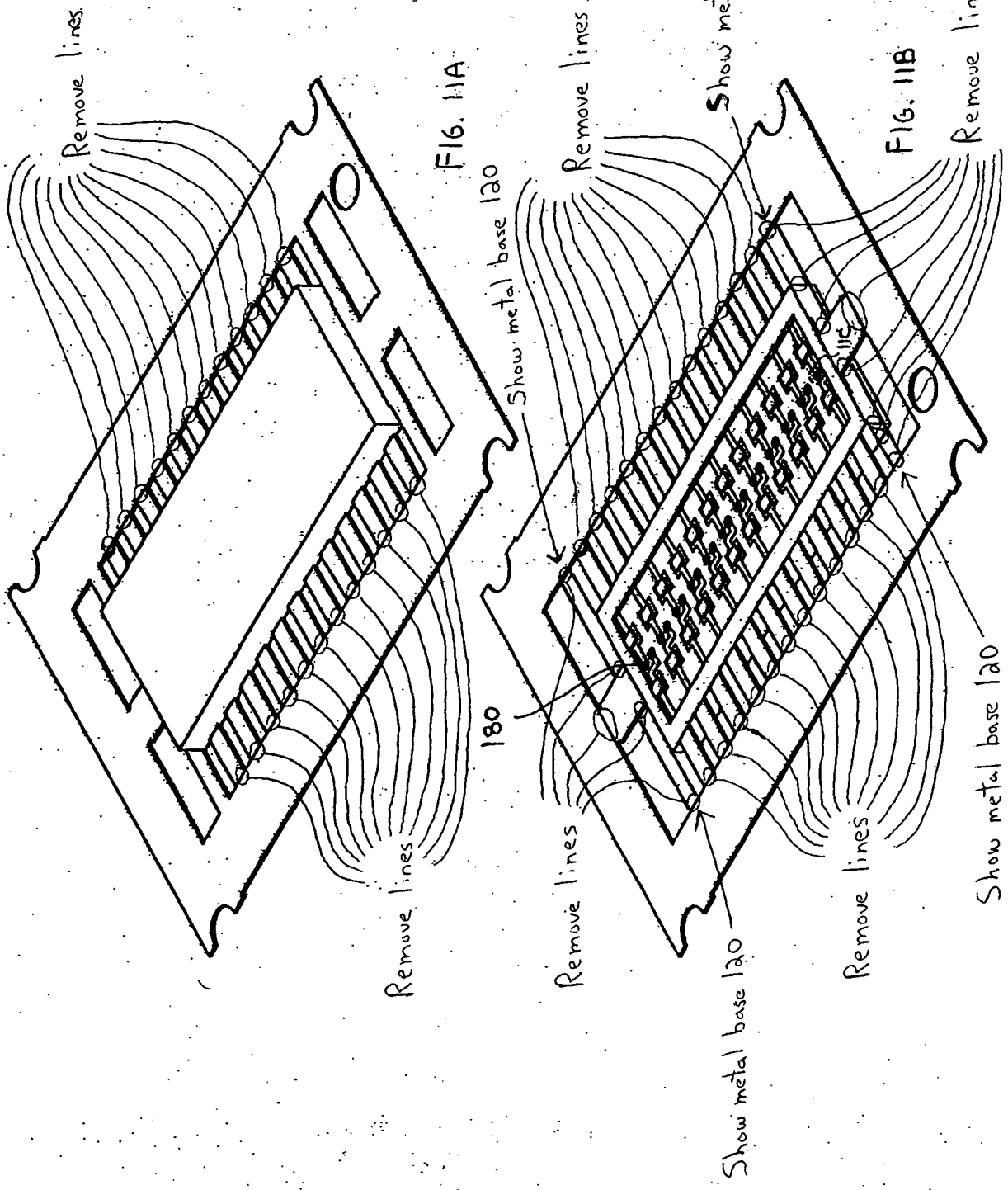


FIG. 11A

FIG. 11B

Annotated Sheet Showing Changes

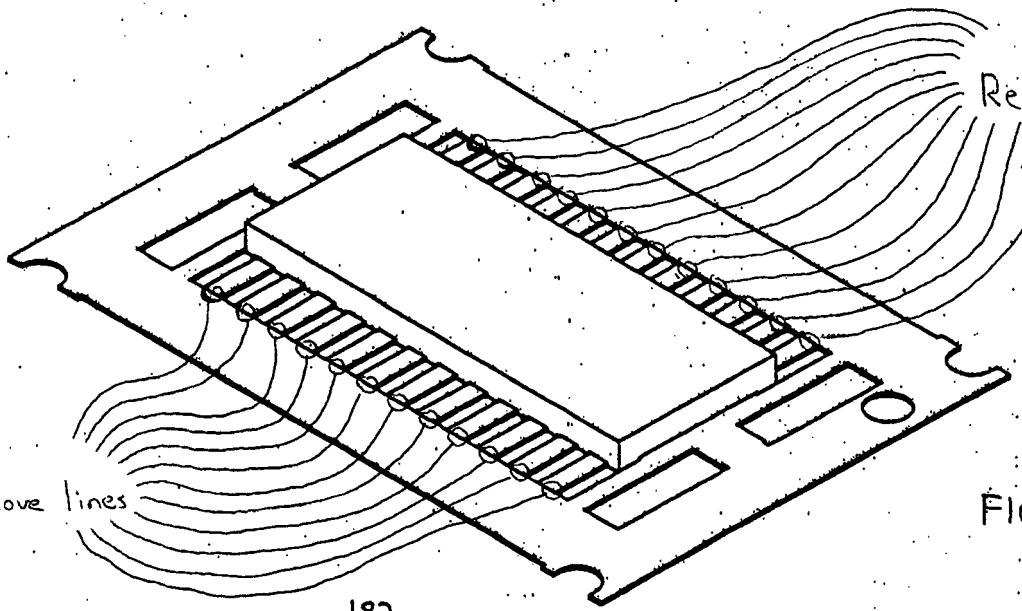


FIG. 12A

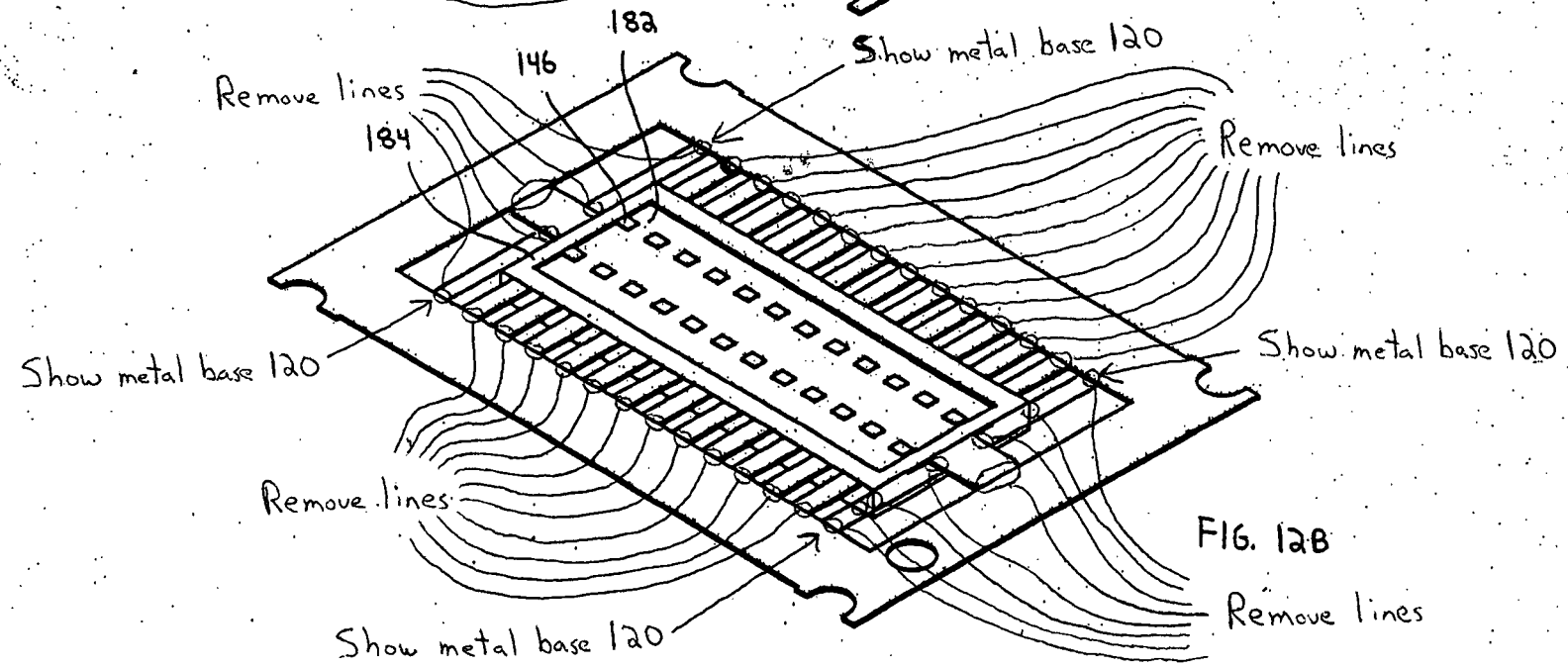


FIG. 12B

Annotated Sheet Showing Changes

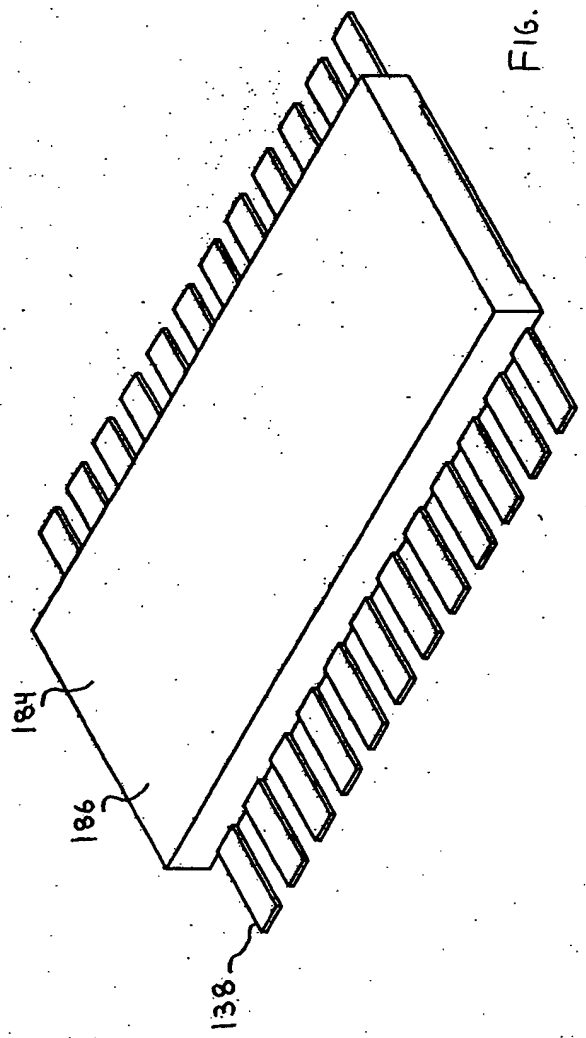


FIG. 13A

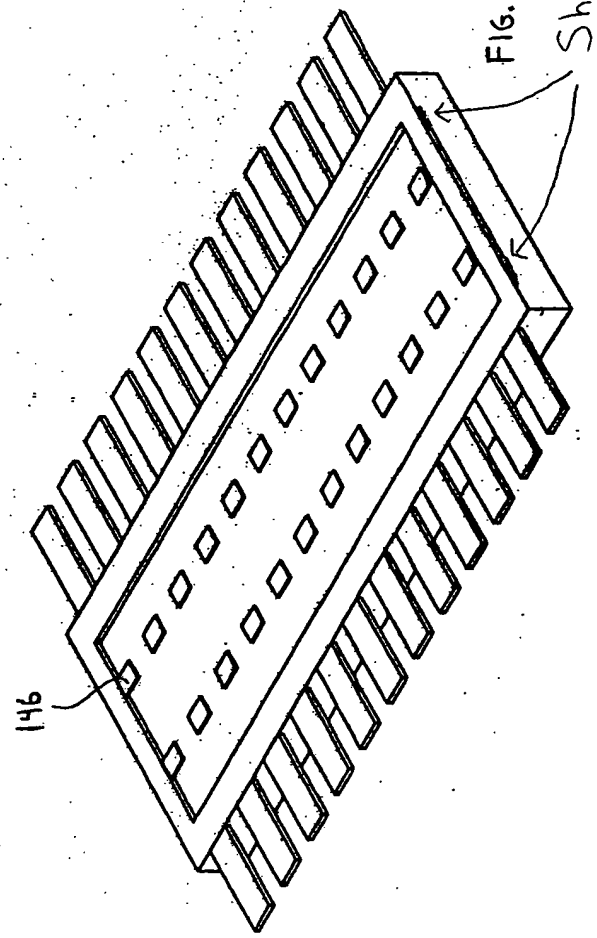
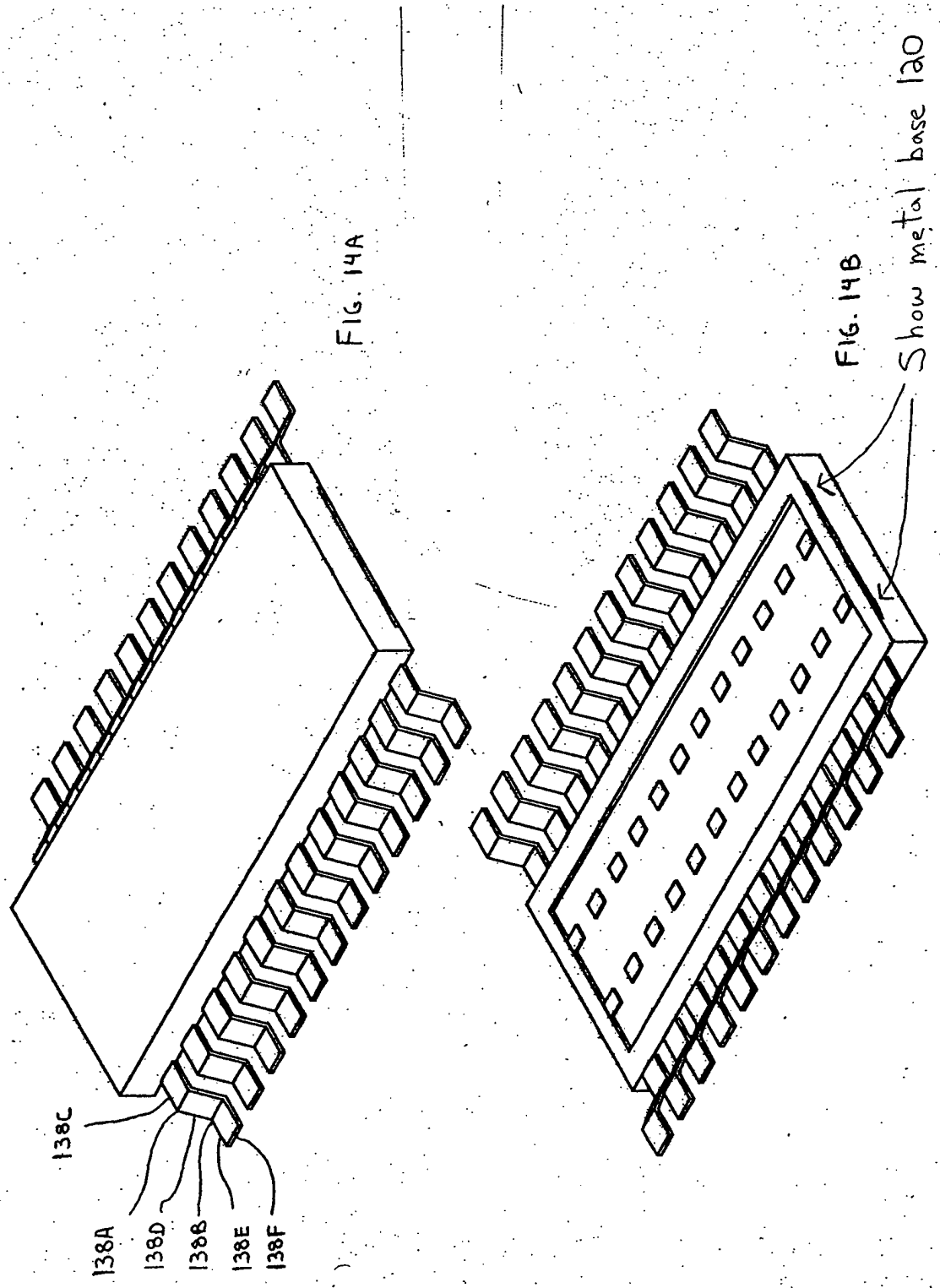


FIG. 13B

Show metal base 120

Annotated Sheet Showing Changes



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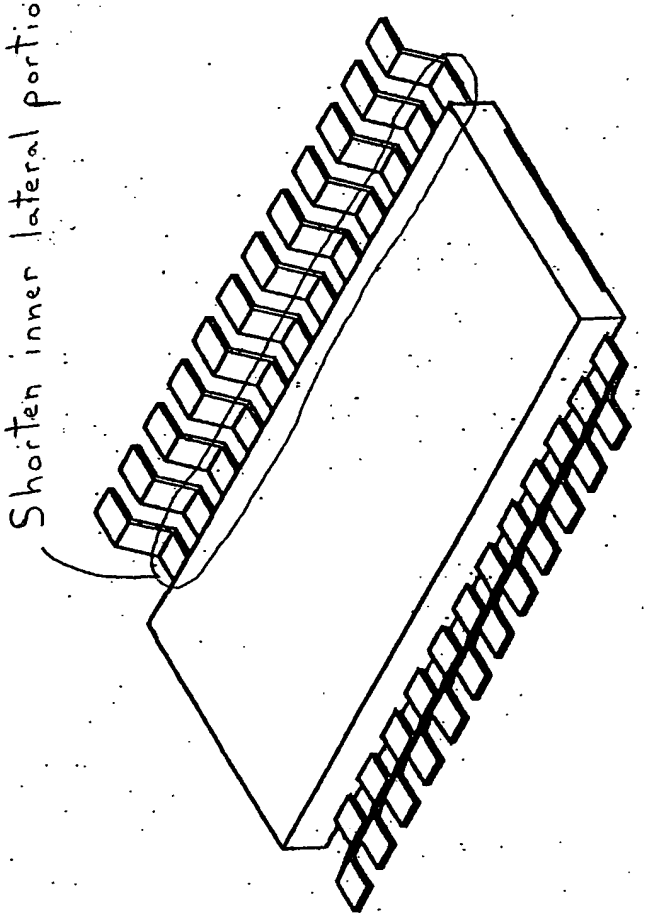

FIG. 14C

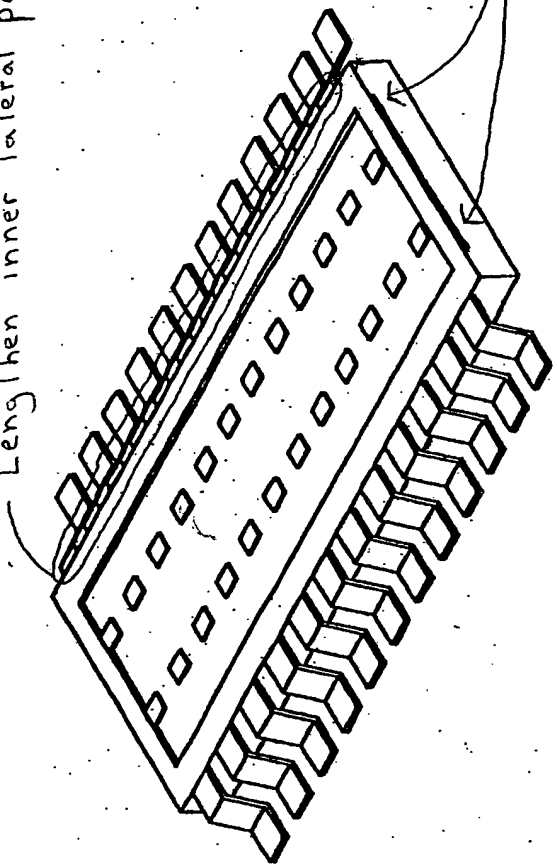

FIG. 14D